II. Solution by G. W. GREENWOOD, Dunbar, Pa.

Taking horizontal and vertical axes through the point of projection and in its plane, the path of a particle with initial velocity v, and making initially an angle θ with the vertical, is given by

$$x=v\sin\theta\, t,\quad y=v\cos\theta\, t-\tfrac{1}{2}gt^2.$$

Eliminating t, we get as the equation to the path described,

$$x^2-\frac{2v^2x\sin\theta\cos\theta}{g}+\frac{2v^2\sin^2\theta y}{g}=0;\ i.\ e.,\ \left[x-\frac{v^2\sin 2\theta}{2g}\right]^2+\left[y-\frac{v^2\cos 2\theta}{2g}\right]$$

$$=\left[y-\frac{v^2}{2g}\right],$$

which is a parabola whose focus is

$$\frac{v^2\sin 2\theta}{2g},\ \frac{v^2\cos 2\theta}{2g}.$$

Now taking horizontal and vertical axes through the center of the wheel, and in its plane, the wheel being supposed to revolve clock-wise, the focus of the parabola described by a particle from the point $(-a\cos\theta,\ a\sin\theta)$, a being the radius of the wheel, is given by

$$x=\frac{v^2\sin 2\theta}{2g}-a\cos\theta,\quad y=\frac{v^2\cos 2\theta}{2g}+a\sin\theta,$$

which is the equation of the required locus in terms of the parameter θ.

An excellent solution of this problem was received from G. B. M. Zerr.

CALCULUS.

241. Proposed by C. N. SCHMALL, 89 Columbia Street, New York City.

Differentiate $y=1+\cfrac{x}{1+\cfrac{x}{1+\cfrac{x}{1+\cfrac{x}{1+\text{etc.}}}}}$

Solution by J. SCHEFFER, A. M., Hagerstown, Md.; FRANCIS RUST, Allegheny, Pa., and the PROPOSER.

The continued fraction is equivalent to $\frac{1}{2}+\sqrt{(\frac{1}{4}+x)}$.

Hence, $y=\frac{1}{2}+\sqrt{(\frac{1}{4}+x)}$, and $\dfrac{dy}{dx}=\dfrac{1}{\sqrt{(1+4x)}}$.

Also solved by G. B. M. Zerr, G. W. Greenwood, and A. H. Holmes.